DISASTER RESILIENCE

Earth Observation for Disaster Risk Reduction, Disaster Resilience and Disaster Risk Financing

Living Planet Symposium

Bonn, 24th May 2022

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GDA

Global Development Assistance

ESA in support of Disaster Risk Management - Evolution

Long-term objective

'mainstream' and 'operationalize' the use EO-based information for international Development Aid projects and activities

Initiatives

2008 → 2016 → 2021

- 2008: eoworld (Earth Observation for Development), eotap (earth observation for a transforming asia pacific), eoeuropa (earth observation for development)
- 2016: eo4sd (earth observation for sustainable development)
- 2021: 

Objectives

2008	2016	2021
• First exploratory activities	• Consolidation of requirements • Mainstream and transfer EO	• to better meet IFIS' and stakeholders' information requirements

EO industry vision

	2008	2016	2021
Business	Exploratory phase	Demonstration phase	Supporting sustainable development with technology
Portfolio	Bespoke projects	Advanced portfolio and semi-automated services	Innovative services
Work practices	Traditional projects	Relevance of stakeholder engagement	Agile approach

Disaster Risk Management (eoworld)

↓

Disaster Risk Reduction (disaster risk reduction eo4sd)

↓

Disaster Finance

↓

Disaster Resilience (GDA)

A changing and challenging context

Disasters context

Dynamic **exposure** due to rapid urbanization

Augmented and changing **hazards** due to climate change

Increasing poverty and hence **vulnerability**

Technological context

More **data** available

More processing capabilities (Cloud computing and processing platforms)

New methods: artificial intelligence

Users context

Stress in open and free data and tools

Diverse knowledge on EO

More technological capacity and willingness to generate

Putting together EO capabilities many domains

EO4SD DRR

E-DRIFT

Process of urbanization

Geo-hazards

Meteo

Terrain deformation

Floods assessments

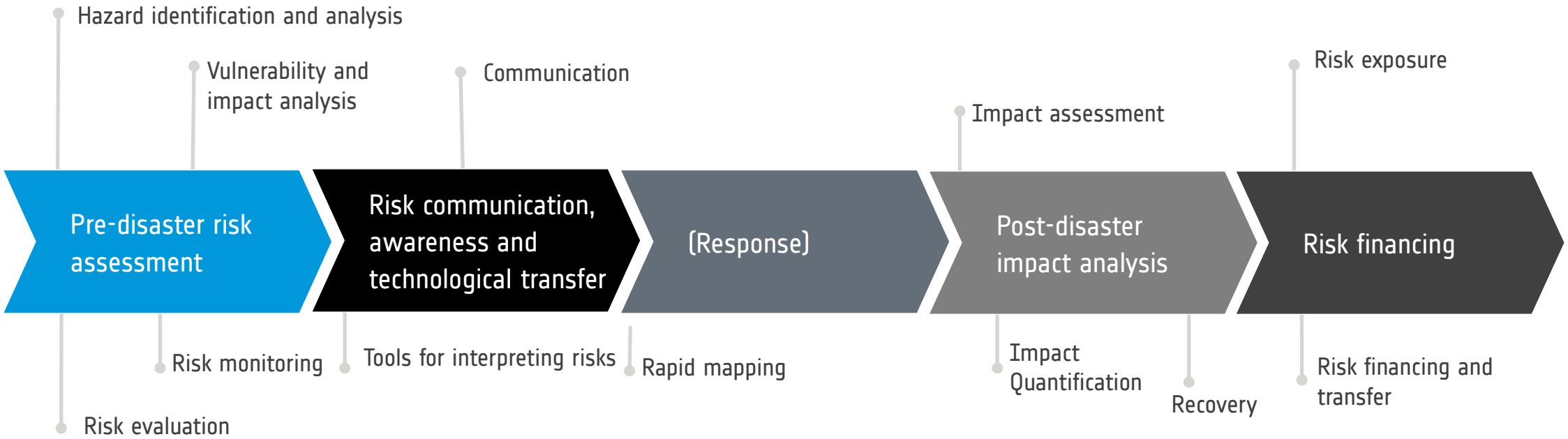
Coastal processes

Platforms for satellite processing

Processes in mountain areas

GDA Disaster Resilience

EO4SD-DRR, e-DRIFT and GDA in the disaster risk management cycle



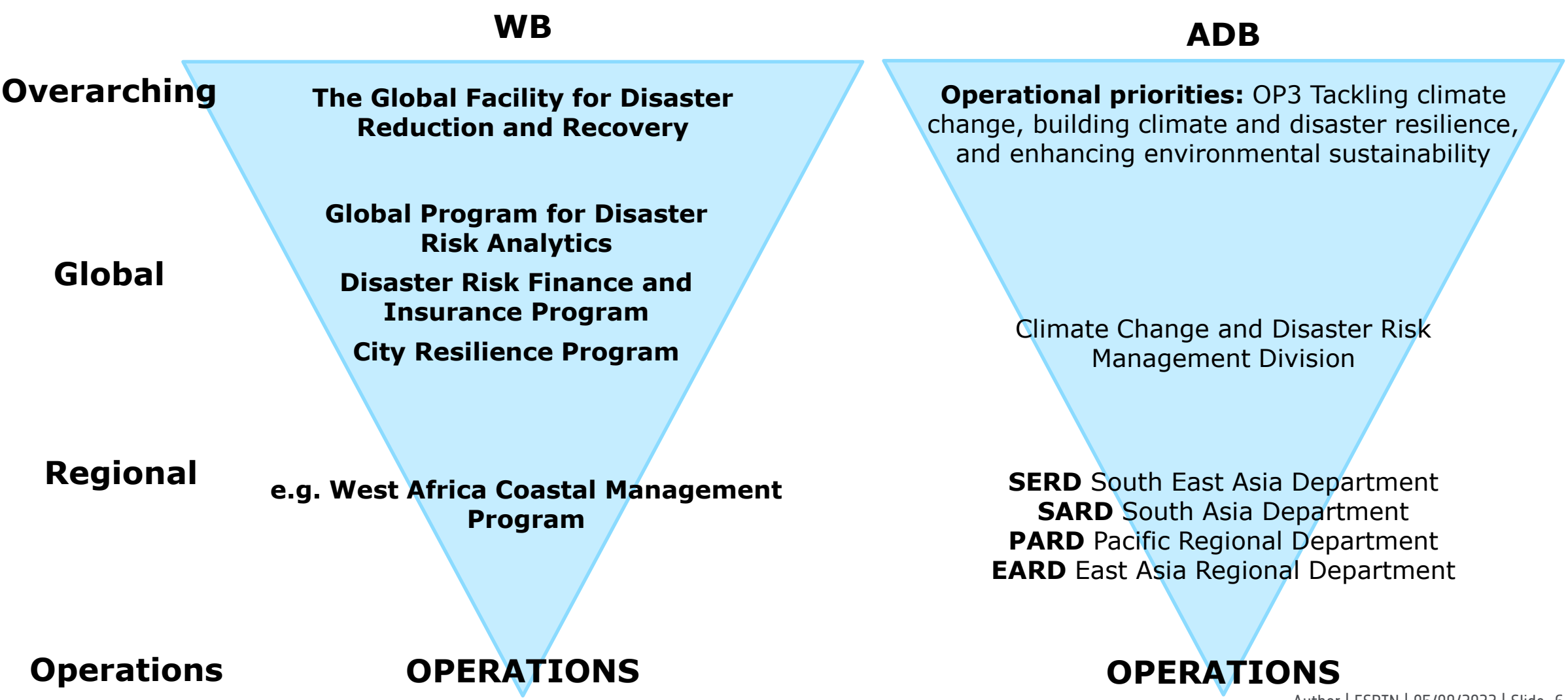
Satellite-based data provides actionable information in all phases of the DRM cycle

EO4SD-DRR is focused on Disaster Risk Reduction

e-DRIFT is focused on Risk Financing

GDA is focused on Disaster Resilience

IFIs context in disasters



Disaster Risk Reduction

Focus on the important:

- leading programmes
- highest priority geospatial information requirements

Covering large areas

- Large geographic regions

Putting together the best of European knowledge

- Demonstration that represent the key European capabilities

Main topics

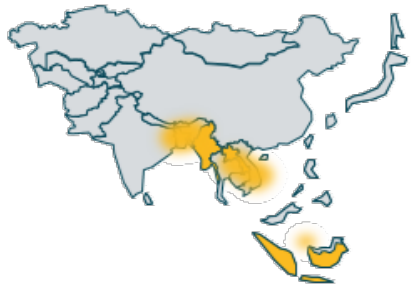
Metrics

- **4 International Financing Institutions involved**
- **36 groups of interest involved**
- **120 IFI staff engaged personally**
- **12 demonstration exercises performed**
- **41 EO based products/services delivered**
- **450 people attending 37 targeted capacity building activities**

14 countries in 4 continents

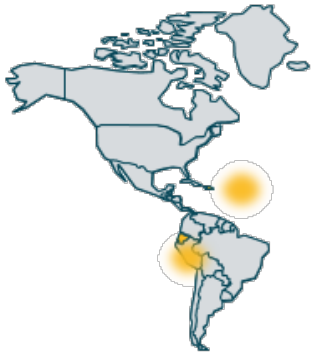
Africa

Mozambique
The Gambia



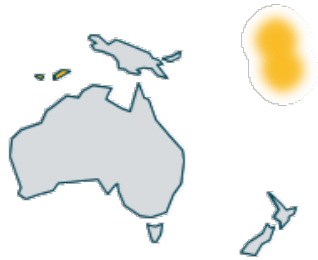
Asia

Vietnam
Bhutan
Indonesia
Myanmar
Bangladesh



South and Central America

Dominican Republic
Ecuador
Guyana
Suriname
Haiti



The Pacific

Tonga

Samoa

Sustainability success example: Sulawesi case

- September 2018
  - 7.5 magnitude earthquake
  - tsunami with a wave height of between 5 and 10 meters, striking directly Palu's bay
- ADB supports a master plan to address the reconstruction and rehabilitation
- EO4SD-DRR -> risk mapping and reconstruction and rehabilitation monitoring products as well as capacity building and technological support
- Local users
  - **Ministry of Public Works and Housing**
  - **BAPPENAS** (National Land **Agency)**
  - **BNPB (**National Board for Disaster Management)
  - Geospatial Information Agency (**BIG**) and
  - **LAPAN** (Institute of Aeronautics and Space)

New urban developments in Palu, Sulawesi

Sustainability success example: Indonesia

Post earthquake reconstruction – Demonstration exercises + Capacity Building to achieve mainstreaming of EO in IFI's practices Sulawesi pilot case for Asian Development Bank and the Government of Indonesia

Earthquake and tsunami

September 2018 +2000 casualties

ADB project require support to ESA

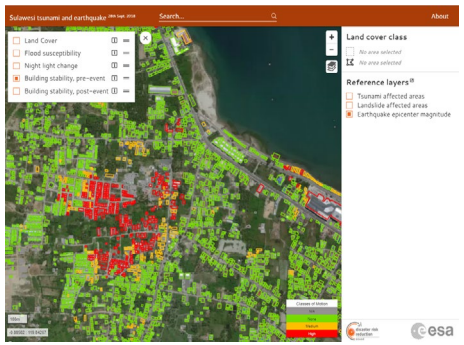
Batch 1: Demonstration

Flood susceptibility , Terrain deformation, Night light change, Land cover

October 2018 - January 2019

esa

2018



1st Capacity building action

Jakarta, June 2019

esa

Batch 2: Demonstration

Terrain deformation assessment (monitoring), Reconstruction monitoring

November 2019

esa

2019

2nd Capacity building action (funded by ADB)

Jakarta-Palu, January 2020

ADB

ADB Technical assistance (operational) to extend provision of services

Terrain deformation monitoring, Reconstruction monitoring

August 2020

ADB

2020

Senior remote sensing experts

Support to local stakeholders through products

Jul 21 – Dec 21

ADB

Ground Motion and Infrastructure Stability Analysis

Ground motion maps

Building Stability Indicators

March – October 2022

ADB

2021-2022

Impact in acceptance: Resilient infrastructure in Myanmar and Bhutan

Rationale

- Landslides in Mountainous areas (Myanmar, Bhutan)
  - constant threat to transportation infrastructure
  - **Impact: lack of connectivity and** limit access to essential services.
- **Mekong Delta**
  - flooded on annual basis to a depth of 1 m to 3 m
  - land subsidence make areas more vulnerable to flooding impacts.
- Local users involved **Departments of Road** (Myanmar, Bhutan) and **Vinh Long city municipality** (Vietnam), as well as TA consultants firms.
- EO4SD-DRR has been in charge of providing hazard and exposure mapping and as well as capacity building.

Photo credits: Olaf Neussner (GIZ)

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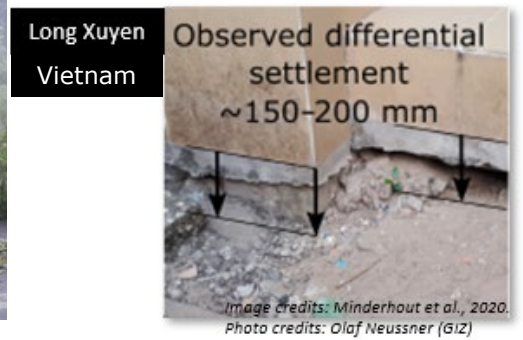

Image credits: Minderhout et al., 2020.
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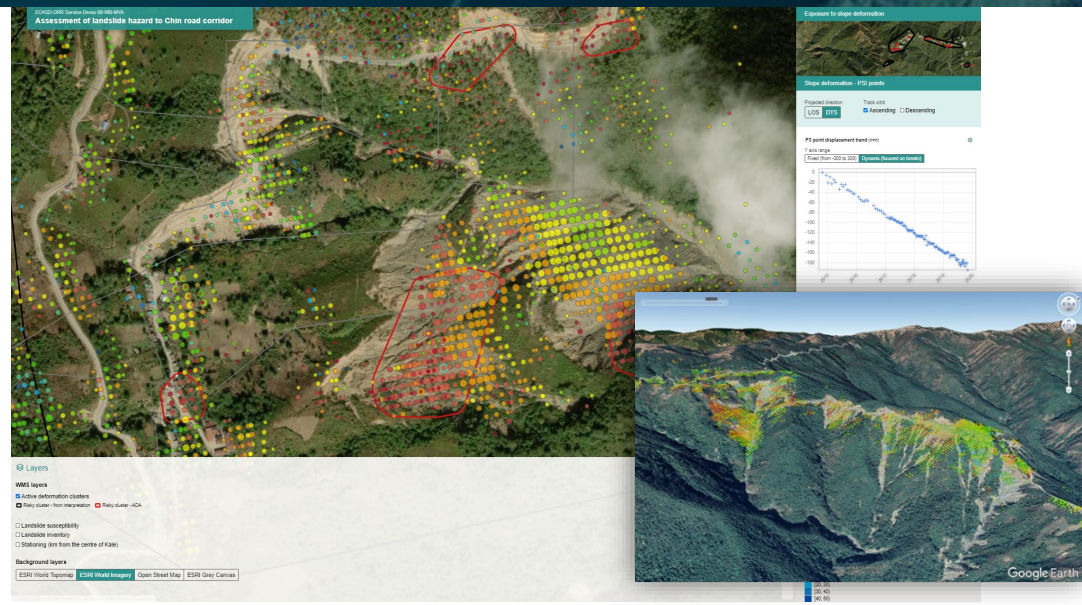
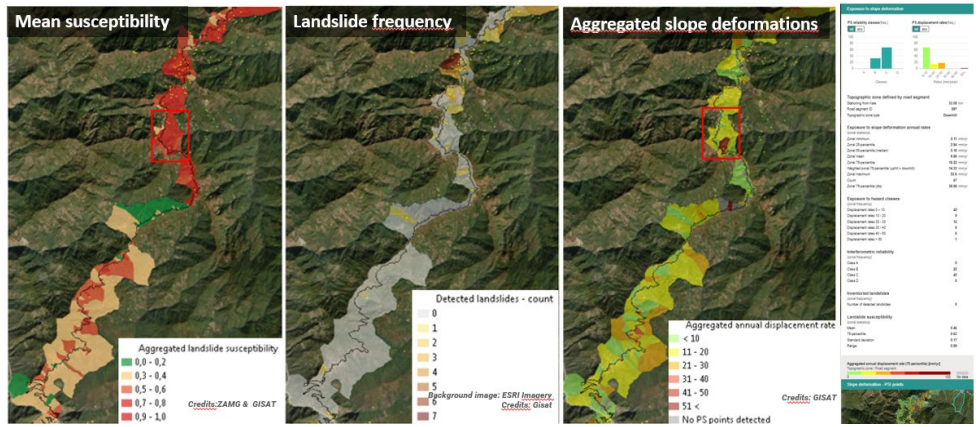
Impact in acceptance: Resilient infrastructure in Myanmar and Bhutan

Effectiveness and outcomes

- EO products and services delivered
  - Inventory of recent landslides
  - ML-based Landslide susceptibility
  - InSAR based mapping of slope instabilities
  - Exposure mapping
- Definition of existing **active slope instabilities**
  - Exposed segments of road
  - Exposed settlements
- 140+ km long corridor analyzed only in a demonstration project
- User FLERP, Myanmar DoR (MoC) and consultants JV-PEC: accepted results and willing to include these methods as part of the project cycle





EO4SD DRR Next steps

Engagement
- Continuous interaction
- At programmatic level, with several members of the staff and at different levels (management-technical)
- Expectations have to be carefully managed

Delivery
- User organizations are slow and complex and timelines are long
- Role of IFI technical leaders is essential to assure effectiveness in the process
- User requirements evolve over time (agile processes desirable)
- Data access, processing and delivery platforms are relevant

Capacity building
- Ideally on-site, ideally non-generic
- Multi-level actions are useful to address different profiles and adapt messages
- Cloud-based exploitation and dissemination platforms (as GEP) are affective for building capacity

Disaster Risk Finance – e-drift

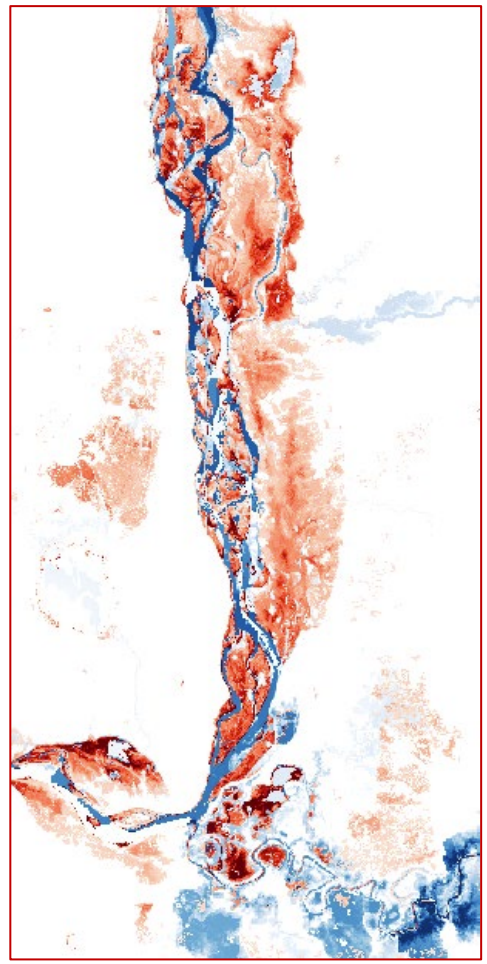
e-Drift realised a package of **fully authomatic processing services for flood detection** on extended areas using SAR Data

The processing services have been tested to support **Disaster Risk Financing** applications such as parametric insurances for sovereign risk

It is the first project that developed in an fully automated way an **exaustive catalog of flood maps** from S1 in SEA

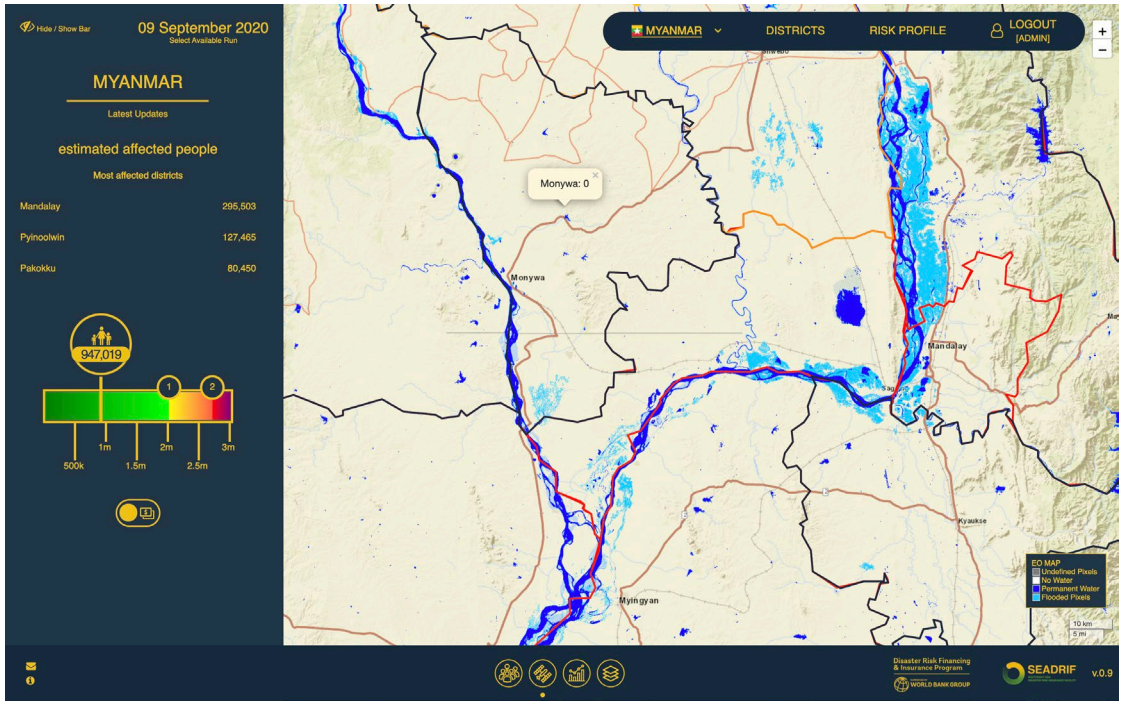
This **EO information is combined with traditional cat-models** in order to have a more accurate risk profile in the country

Countries covered were Laos, Cambodia and Myanmar



Disaster Risk Finance – e-drift

e-DRIFT project supported an operational application within SEADRIF SOUTHEAST ASIA DISASTER RISK INSURANCE FACILITY



A parametric Insurance product was developed with the support of the **WB DRFI**

The system supported by e-Drift services run in **pre-operation from 2019 to 2020**

The Service is **now operational** and currently supports pay-outs for LAOS **since 2021**

Next Steps

- Increased acquisition frequency by integrating several satellite sources (mix of SAR and Optical sensors)
- Improved detection capacity in urban areas
- Improved and more transparent combined use of EO information and model information
- Transition towards and EO-driven approach for the Parametric Insurance Trigger

Avenues of cooperation for Disaster Resilience

Principles

- Target: Highest priority, highest impact, high feasibility
- Relations must change. Communication: continuous, adaptive and iterative
- Demand driven!! Adaptation of technology to needs (evolution of services)

Requirements

Generic	**Solutions that can be applied/ replicated globally or regionally**	**Integration of EO methods in systems**	**Low cost-open data / platforms**	**Decision support systems**
Domain specific	**Exposure -> socio-economic exposure (not only $value!)**	**End-to-end methods for disaster risk**	**Risk assessments in Urban and coastal contexts**	**Advanced hazard products**

Global Development Assistance

THE WORLD BANK

- End to end method for disaster risk metrics at national level for CCDR (Cameroon and Cote D'Ivoire)
- Filling data gaps in cities for NBS in Thailand and DRC
- Morocco: Enhanced flood and exposure mapping for better risk finance metrics
- Coastal erosion risk indices in Ghana - West Africa
- EO processing environments for dissemination and awareness raising in Tanzania

Disaster Risk Analytics

NATURE-BASED SOLUTIONS PROGRAM

Disaster Risk Financing & Insurance Program
SUPPORTED BY WORLD BANK GROUP

WACA

Resilience Academy

ADB ASIAN DEVELOPMENT BANK

- Vulnerability and risk diagnosis to subsidence and floods in Indonesia
- Harsh weather (dzuds) and impact assessment in Mongolia
- Flood and landslides assessment in Bangladesh
- Multi-hazard early warning system in Nepal

Global Development Assistance

End

Three ESA initiatives for mainstreaming EO in the context of Disaster Resilience